fully hewn stones and ornamented with wonderful carvings. And they did it all without the aid of iron. To develop so far must have required centuries, and so we may safely say that Yucatan once stimulated its people to an activity of mind and body comparable to that of any part of the world. Were the people capable of stimulation because of something in the fiber of the original race, or was the stimulus due to something in their environment?

AMUNDSEN'S EXPEDITION TO THE SOUTH POLE*

The plan of the third *Fram* expedition was twofold: first, the attainment of the South Pole and, second, the exploration of the North Polar regions. This evening I have the honor to report to you on the accomplishment of the first part of this plan.

I can only mention briefly here the expeditions which have worked in the region which we had selected for our starting point. As we wished to reach the South Pole our first problem was to go south as far as possible with our ship and there establish our station. Even so, the sled journeys would be long enough. I knew that the English expedition would again choose their old winter quarters in McMurdo Sound, South Victoria Land, as their starting point. From newspaper report it was known that the Japanese had selected King Edward VII Land. In order to avoid these two expeditions we had to establish our station on the Great Ice Barrier as far as possible from the starting points of the two other expeditions.

The Great Ice Barrier, also called the Ross Barrier, lies between South Victoria Land and King Edward VII Land and has an extent of about 515 miles† The first to reach this mighty ice formation was Sir James Clark Ross in 1841. He did not dare approach the great ice wall, 100 feet high, with his two sailing ships, the *Erebus* and the *Terror,* whose progress southward was impeded by this mighty obstacle. He examined the ice wall from a distance, however, as far as possible. His observations showed that the Barrier is not a continuous, abrupt ice wall, but is interrupted by bays and

*Lecture delivered in German by Roald Amundsen before the Berlin Geographical Society on Oct. 9, 1912. Translated and reprinted from the *Zeitschr. der Gesell. für Erdkunde zu Berlin*, 1912, No. 7, pp. 481–498.

†All values have been changed from the metric system to English equivalents.

small channels. On Ross's map a bay of considerable magnitude may be seen.

The next expedition was that of the *Southern Cross* in 1900. It is interesting to note that this party found the bay mentioned above at the same place where Ross had seen it in 1841, nearly sixty years before; that this expedition also was able to land a few miles to the east of the large bay in a small bay, named Balloon Bight, and from there to ascend the Ice Barrier, which heretofore had been considered an insurmountable obstacle to further advance towards the south.

In 1901 the *Discovery* steamed along the Barrier and confirmed in every respect what the *Southern Cross* had observed. Land was also discovered in the direction indicated by Ross, namely King Edward VII Land. Scott, too, landed in Balloon Bight, and, like his predecessors, saw the large bay to the west.

In 1908 Shackleton arrived there on the *Nimrod.* He, too, followed along the edge of the Ice Barrier. He came to the conclusion that disturbances had taken place in the Ice Barrier. The shore line of Balloon Bight, he thought, had changed and merged with the large bay to the west. This large bay, which he thought to be of recent origin, he named Bay of Whales. He gave up his original plan of landing there, as the Ice Barrier appeared to him too dangerous for the establishment of winter quarters.

It was not difficult to determine that the bay shown on Ross's map and the so-called Bay of Whales are identical; it was only necessary to compare the two maps. Except for a few pieces that had broken off from the Barrier, the bay had remained the same for the last seventy years. It was therefore possible to assume that the bay did not owe its origin to chance and that it must be underlain by land, either in the form of sand banks or otherwise.

This bay we decided upon as our base of operations. It lies 400 miles from the English station in McMurdo Sound and 115 miles from King Edward VII Land. We could therefore assume that we should be far enough from the English sphere of interest and need not fear crossing the route of the English expedition. The reports concerning the Japanese station on King Edward VII Land were indefinite: we took it for granted, however, that a distance of 115 miles would suffice.

On August 9, 1910, we left Norway on the *Fram,* the ship that had originally been built for Nansen. We had ninety-seven superb Eskimo dogs and provisions for two years. The first harbor we

reached was Madeira. There the last preparations were made for our voyage to the Ross Barrier—truly not an insignificant distance which we had to cover, namely, 16,000 nautical miles from Norway to the Bay of Whales. We had estimated that this trip would require five months. The *Fram,* which has justly been called the staunchest polar ship in the world, on this voyage across practically all of the oceans, proved herself to be extremely seaworthy. Thus we traversed without a single mishap the regions of the northeast and of the southeast trades, the stormy seas of the "roaring forties," the fogs of the fifties, the ice-filled sixties and reached our field of work at the Ice Barrier on Jan. 14, 1911. Everything had gone splendidly.

The ice in the Bay of Whales had just broken up, and we were able to advance considerably farther south than any of our predecessors had done. We found a quiet little nook behind a projecting ice cape; from here we could transfer our equipment to the Barrier with comparative safety. Another great advantage was that the Barrier at this place descended very gradually to the sea ice, so that we had the best possible surface for our sleds. Our first undertaking was to ascend the Barrier in order to get a general survey and to determine a suitable place for the erection of the house which we had brought with us. The supposition that this part of the Barrier rests on land seemed to be confirmed immediately by our surroundings. Instead of the smooth, flat surface which the outer wall of the Barrier presents, we here found the surface to be very uneven. We everywhere saw sharp hills and points between which there were pressure-cracks and depressions filled with large masses of drift. These features were not of recent date. On the contrary, it was easy to see that they were very old and that they must have had their origin at a time which long preceded the period of Ross's visit.

Originally we had planned to establish our station several miles from the edge of the Barrier, in order not to subject ourselves to the danger of an unwelcome and involuntary sea trip, which might have occurred had the part of the Barrier on which we erected our house broken off. This precaution, however, was not necessary, as the features which we observed on our first examination of the area offered a sufficient guarantee for the stability of the Barrier at this point.

In a small valley, hardly two and a half miles from the ship's anchorage, we therefore selected a place for our winter quarters. It was protected from the wind on all sides. On the next day we began unloading the ship. We had brought with us material for house

building as well as equipment and provisions for nine men for several years. We divided into two groups, the ship's group and the land group. The first was composed of the commander of the ship, Captain Nilsen, and the nine men who were to stay on board to take the *Fram* out of the ice and to Buenos Aires. The other group consisted of the men who were to occupy the winter quarters and march on to the south. The ship's group had to unload everything from the ship upon the ice. There the land group took charge of the cargo and brought it to the building site. At first we were rather unaccustomed to work, as we had had little exercise on the long sea voyage. But before long we were all "broken in," and then the transfer to the site of our home "Framheim" went on rapidly; the house grew daily.

When all the material had been landed our skilled carpenters, Olav Bjaaland and Jörgen Stubberud, began building the house. It was a ready-made house which we had brought with us; nothing had to be done but to put together the various numbered parts. In order that the house might brave all storms, its bottom rested in an excavation four feet beneath the surface. On Jan. 28, fourteen days after our arrival, the house was completed, and all provisions had been landed. A gigantic task had been performed; everything seemed to point towards a propitious future. But no time was to be lost; we had to make use of every minute.

The land group had in the meantime been divided into two parties, one of which saw to it that the provisions and equipment still lacking were taken out of the ship. The other party was to prepare for an excursion towards the south which had in view the exploration of the immediate environs and the establishment of a depot.

On Feb. 10 the latter group marched south. There were four of us with eighteen dogs and three sleds packed with provisions. That morning of our start is still vividly in my memory. The weather was calm, the sky hardly overcast. Before us lay the large, unlimited snow plain, behind us the Bay of Whales with its projecting ice capes and at its entrance our dear ship, the *Fram*. On board the flag was hoisted; it was the last greeting from our comrades of the ship. No one knew whether and when we should see each other again. In all probability our comrades would no longer be there when we returned; a year would probably elapse before we could meet again. One more glance backwards, one more parting greeting and then—forward.

Our first advance on the Barrier was full of excitement and sus-

pense. So many questions presented themselves: What will be the nature of the region we have to cross? How will the sleds behave? Will our equipment meet the requirements of the situation? Have we the proper hauling power? If we were to accomplish our object, everything had to be of the best. Our equipment was substantially different from that of our English competitors. We placed our whole trust on Eskimo dogs and skis, while the English, as a result of their own experience, had abandoned dogs as well as skis, but, on the other hand, were well equipped with motor sleds and ponies.

We advanced rapidly on the smooth, white snow plain. On Feb. 14 we reached 80° S. We had thus covered 99 miles. We established a depot here mainly of 1,300 pounds of provisions which we intended to use on our main advance to the south in the spring. The return journey occupied two days; on the first we covered forty miles and on the second fifty-seven miles. When we reached our station the *Fram* had already left. The bay was lonely and deserted; only seals and penguins were in possession of the place.

This first excursion to the south, although brief, was of great importance to us. We now knew definitely that our equipment and our pulling power were eminently suited to the demands upon them. In their selection no mistake had been made. It was now for us to make use of everything to the best advantage.

Our sojourn at the station was only a short one. On Feb. 22 we were ready again to carry supplies to a more southern depot. We intended to push this depot as far south as possible. On this occasion our expedition consisted of eight men, seven sleds, and forty-two dogs. Only the cook remained at "Framheim."

On Feb. 27 we passed the depot which we had established at 80° S.; we found everything in the best of order. On March 4 we reached the eighty-first parallel and deposited there 1,150 pounds of provisions. Three men returned from here to the station while the five others continued toward the south and reached the eighty-second parallel on March 8, depositing there 1,375 pounds of provisions. We then returned, and on March 22 were again at home. Before the winter began we made another excursion to the depot in 80° S., and added to our supplies there 2,400 pounds of fresh salt meat and 440 pounds of other provisions. On April 11 we returned from this excursion; this ended all of our work connected with the establishment of depots. Up to that date we had carried out 6,700 pounds of provisions and had distributed these in three repositories.

The part of the Barrier over which we had gone heretofore has

an average height of 165 feet and looked like a flat plain which continued with slight undulations without any marked features that could have served for orientation. It has heretofore been the opinion that on such an endless plain no provisions can be cached without risking their loss. If we were, however, to have the slightest chance of reaching our goal we had to establish depots, and that to as great an extent as possible. This question was discussed among us, and we decided to establish signs across our route, and not along it, as has been generally done heretofore. We therefore set up a row of signs at right angles to our route, that is in an east-west direction from our depots. Two of these signs were placed on opposite sides of each of the three depots, at a distance of 5.6 miles (9 kilometers) from them; and between the signs and the depot two flags were erected for every kilometer. In addition, all flags were marked so that we might know the direction and distance of the depot to which it referred. This provision proved entirely trustworthy; we were able to find our depots even in dense fog. Our compasses and pedometers were tested at the station; we knew that we could rely upon them.

By our excursions to the depots we had gained a great deal. We had not only carried a large amount of provisions towards the south, but we had also gained valuable experience. That was worth more and was to be of value to us on our final advance to the pole.

The lowest temperature we had observed on these depot excursions was —50° Centigrade. The fact that it was still summer when we recorded this temperature warned us to see that our equipment was in good condition. We also realized that our heavy sleds were too unwieldly and that they could easily be made much lighter. This criticism was equally applicable to the greater part of our equipment.

Several days before the disappearance of the sun were devoted to hunting seal. The total weight of the seals killed amounted to 132,000 pounds. We therefore had ample provisions for ourselves as well as for our 115 dogs.

Our next problem was to supply a protective roof for our dogs. We had brought with us ten large tents in which sixteen men could easily find room. They were set up on the Ice Barrier; the snow was then dug out to a depth of six and a half feet inside the tents, so that each dog hut was nearly twenty feet high. The diameter of a dog hut on the ground was sixteen feet. We made these huts spacious so that they might be as airy as possible and thus avert the frost which is so injurious to dogs. Our purpose was entirely attained, for even in the severest weather no dogs were frozen. The

tents were always warm and comfortable. Twelve dogs were housed in each, and every man had to take care of his own pack.

After we had seen to the wants of the dogs we could then think of ourselves. As early as April the house was entirely covered by snow. In this newly drifted snow, passageways were dug connecting directly with the dog huts. Ample room was thus at our disposal without the need on our part of furnishing building material. We had workshops, a blacksmith shop, a room for sewing, one for packing, a storage room for coal, wood and oil, a room for regular baths and one for steam baths. The winter might be as cold and stormy as it would; it could do us no harm.

On April 21 the sun disappeared and the longest night began which had ever been experienced by man in the Antarctic. We did not need to fear the long night for we were well equipped with provisions for years and had a comfortable, well-ventilated, well-situated and protected house. In addition we had our splendid bathroom where we could take a bath every week. It really was a veritable sanatorium.

After these arrangements had been completed we began preparations for the main advance in the following spring. We had to improve our equipment and make it lighter. We discarded all our sleds, for they were too heavy and unwieldy for the smooth surface of the Ice Barrier. Our sleds weighed 165 pounds each. Bjaaland, our ski and sled maker, took the sleds in hand, and when spring arrived he had entirely made over our sledge equipment. These sleds weighed only one-third as much as the old ones. In the same way it was possible to reduce the weight of all other items of our equipment. Packing the provisions for the sledge journey was of the greatest importance. Capt. Johansen attended to this work during the winter. Each of the 42,000 loaves of hard bread had to be handled separately before it could be assigned to its proper place. In this way the winter passed quickly and agreeably. All of us were occupied all the time. Our house was warm, dry, light and airy, and we all enjoyed the best of health. We had no physician and needed none.

Meteorological observations were taken continuously. The results were surprising. We had thought that we should have disagreeable, stormy weather, but this was not the case. During the whole year of our sojourn at the station we experienced only two moderate storms. The rest of the time light breezes prevailed, mainly from an easterly direction. Atmospheric pressure was as a rule very low, but

remained constant. The temperature sank considerably, and I deem it probable that the mean annual temperature which we recorded, —26° Centigrade, is the lowest mean temperature which has ever been observed. During five months of the year we recorded temperatures below —50° Centigrade. On Aug. 23 the lowest temperature was recorded, —59°. The *aurora australis,* corresponding to the northern lights of the Arctic, was observed frequently and in all directions and forms. This phenomenon changed very rapidly, but, except in certain cases, was not very intensive.

On Aug. 24 the sun reappeared. The winter had ended. Several days earlier we had put everything in the best of order, and when the sun rose over the Barrier we were ready to start. The dogs were in fine condition.

From now on we observed the temperature daily with great interest, for as long as the mercury remained below —50° a start was not to be thought of. In the first days of September all signs indicated that the mercury would rise. We therefore resolved to start as soon as possible. On Sept. 8 the temperature was —30°. We started immediately, but this march was to be short. On the next day the temperature began to sink rapidly, and several days later the thermometer registered —55° Centigrade. We human beings could probably have kept on the march for some time under such a temperature, for we were protected against the cold by our clothing; but the dogs could not have long withstood this degree of cold. We were therefore glad when we reached the eightieth parallel. We deposited there our provisions and equipment in the depot which we had previously erected and returned to "Framheim."

The weather now became very changeable for a time—the transitional period from winter to summer; we never knew what weather the next day would bring. Frostbites from our last march forced us to wait until we definitely knew that spring had really come. On Sept. 24 we saw at last positive evidence that spring had arrived: the seals began to clamber up on the ice. This sign was hailed with rejoicing—not a whit less the seal meat which Bjaaland brought on the same day. The dogs, too, enjoyed the arrival of spring. They were ravenous for fresh seal meat. On Sept. 29 another unrefutable sign of spring appeared in the arrival of a flock of Antarctic petrels. They flew around our house inquisitively to the joy of all, not only of ourselves, but also of the dogs. The latter were wild with joy and excitement, and ran after the birds in hopes of getting a delicate morsel. Foolish dogs! Their chase ended with a wild fight among themselves.

On Oct. 20 the weather had at last become so stable that we could start. We had, meanwhile, changed our original plan, which was that we should all advance southward together. We realized that we could travel with perfect safety in two groups and thus accomplish much more. We arranged that three men should go to the east to explore King Edward VII Land; the remaining five men were to carry out the main plan, the advance on the South Pole.

October 20 was a beautiful day. Clear, mild weather prevailed. The temperature was 1° Centigrade above zero. Our sleds were light, and we could advance rapidly. We did not need to hurry our dogs for they were eager enough themselves. We numbered five men and fifty-two dogs with four sleds. Together with the provisions which we had left in the three depots at the eightieth, the eighty-first and the eighty-second parallels we had sufficient sustenance for 120 days.

Two days after our departure we nearly met with a serious accident. Bjaaland's sled fell into one of the numerous crevasses. At the critical moment we were fortunately able to come to Bjaaland's aid; had we been a moment later the sled with its thirteen dogs would have disappeared in the seemingly bottomless pit.

On the fourth day we reached our depot at 80° S. We remained there two days and gave our dogs as much seal meat as they would eat.

Between the eightieth and the eighty-first parallel the Barrier ice along our route was even, with the exception of a few low undulations; dangerous hidden places were not to be found. The region between the eighty-first and the eighty-second parallel was of a totally different character. During the first nineteen miles we were in a veritable labyrinth of crevasses, very dangerous to cross. At many places yawning abysses were visible because large pieces of the surface had broken off; the surface therefore presented a very unsafe appearance. We crossed this region four times in all. On the three first times such a dense fog prevailed that we could only recognize objects a few feet away. Only on the fourth occasion did we have clear weather. Then we were able to see the great difficulties to which we had been exposed.

On Nov. 5 we reached the depot at the eighty-second parallel and found everything in order. For the last time our dogs were able to have a good rest and eat their fill; and they did so thoroughly during their two days' rest.

Beginning at the eightieth parallel we constructed snow cairns

which should serve as sign-posts on our return. In all we erected 150 such sign-posts, each of which required sixty snow blocks. About 9,000 snow blocks had therefore to be cut out for this purpose. These cairns did not disappoint us, for they enabled us to return by exactly the same route we had previously followed.

South of the eighty-second parallel the Barrier was, if possible, still more even than farther north; we therefore advanced quite rapidly. At every unit parallel which we crossed on our advance towards the south we established a depot. We thereby doubtlessly exposed ourselves to a certain risk, for there was no time to set up sign-posts around the depots. We therefore had to rely on snow cairns. On the other hand, our sleds became lighter, so that it was never hard for the dogs to pull them.

When we reached the eighty-third parallel we saw land in a southwesterly direction. This could only be South Victoria Land, probably a continuation of the mountain range which runs in a southeasterly direction and which is shown on Shackleton's map. From now on the landscape changed more and more from day to day: one mountain after another loomed up, one always higher than the other. Their average elevation was 10,000 to 16,000 feet. Their crest-line was always sharp; the peaks were like needles. I have never seen a more beautiful, wild and imposing landscape. Here a peak would appear with somber and cold outlines, its head buried in the clouds; there one could see snow fields and glaciers thrown together in hopeless confusion. On Nov. 11 we saw land to the south and could soon determine that a mountain range, whose position is about 86° S. and 163° W., crosses South Victoria Land in an easterly and northeasterly direction. This mountain range is materially lower than the mighty mountains of the rest of South Victoria Land. Peaks of an elevation of 1,800 to 4,000 feet were the highest. We could see this mountain chain as far as the eighty-fourth parallel, where it disappeared below the horizon.

On Nov. 17 we reached the place where the Ice Barrier ends and the land begins. We had proceeded directly south from our winter quarters to this point. We were now in 85° 7′ S. and 165° W. The place where we left the Barrier for the land offered no special difficulties. A few extended undulating reaches of ice had to be crossed which were interrupted by crevasses here and there. Nothing could impede our advance. It was our plan to go due south from "Framheim" and not to deviate from this direction unless we should be forced to by obstacles which nature might place in our path. If

our plan succeeded it would be our privilege to explore completely unknown regions and thereby to accomplish valuable geographic work.

The immediate ascent due south into the mountainous region led us between the high peaks of South Victoria Land. To all intents and purposes no great difficulties awaited us here. To be sure, we should probably have found a less steep ascent if we had gone over to the newly discovered mountain range just mentioned. But as we maintained the principle that direct advance due south was the shortest way to our goal, we had to bear the consequences.

At this place we established our principal depot and left provisions for thirty days. On our four sleds we took provisions with us for sixty days. And now we began the ascent to the plateau. The first part of the way led us over snow-covered mountain slopes, which at times were quite steep, but not so much so as to prevent any of us from hauling up his own sled. Farther up, we found several glaciers which were not very broad but were very steep. Indeed, they were so steep that we had to harness twenty dogs in front of each sled. Later the glaciers became more frequent, and they lay on slopes so steep that it was very hard to ascend them on our skis. On the first night we camped at a spot which lay 2,100 feet above sea level. On the second day we continued to climb up the mountains, mainly over several small glaciers. Our next camp for the night was at an altitude of 4,100 feet above the sea.

On the third day we made the disagreeable discovery that we should have to descend 2,100 feet, as between us and the higher mountains to the south lay a great glacier which crossed our path from east to west. This could not be helped. The expedition therefore descended with the greatest possible speed and in an incredibly short time we were down on the glacier, which was named Axel Heiberg Glacier. Our camp of this night lay at about 3,100 feet above sea level. On the following day the longest ascent began; we were forced to follow Axel Heiberg Glacier. At several places ice blocks were heaped up so that its surface was hummocky and cleft by crevasses. We had therefore to make detours to avoid the wide crevasses which, below, expanded into large basins. These latter, to be sure, were filled with snow; the glacier had evidently long ago ceased to move. The greatest care was necessary in our advance, for we had no inkling as to how thick or how thin the cover of snow might be. Our camp for this night was pitched in an extremely picturesque situation at an elevation of about 5,250 feet above sea level. The glacier

was here hemmed in by two mountains which were named "Fridtjof Nansen" and "Don Pedro Christophersen," both 16,000 feet high.

Farther down towards the west at the end of the glacier "Ole Engelstad Mountain" rises to an elevation of about 13,000 feet. At this relatively narrow place the glacier was very hummocky and rent by many deep crevasses, so that we often feared that we could not advance farther. On the following day we reached a slightly inclined plateau which we assumed to be the same which Shackleton describes. Our dogs accomplished a feat on this day which is so remarkable that it should be mentioned here. After having already done heavy work on the preceding days, they covered nineteen miles on this day and overcame a difference in altitude of 5,700 feet. On the following night we camped at a place which lay 10,800 feet above sea level. The time had now come when we were forced to kill some of our dogs. Twenty-four of our faithful comrades had to die. The place where this happened was named the "Slaughter House." On account of bad weather we had to stay here for four days. During this stay both we and the dogs had nothing except dog meat to eat. When we could at last start again on Nov. 26, the meat of ten dogs only remained. This we deposited at our camp; fresh meat would furnish a welcome change on our return. During the following days we had stormy weather and thick snow flurries, so that we could see nothing of the surrounding country. We observed, however, that we were descending rapidly. For a moment, when the weather improved for a short time, we saw high mountains directly to the east. During the heavy snow squall on Nov. 28 we passed two peculiarly shaped mountains lying in a north-south direction; they were the only ones that we could see on our right hand. These "Helland-Hansen Mountains" were entirely covered by snow and had an altitude of 9,200 feet. Later they served as an excellent landmark for us.

On the next day the clouds parted and the sun burst forth. It seemed to us as if we had been transferred to a totally new country. In the direction of our advance rose a large glacier, and to the east of it lay a mountain range running from southeast to northwest. Toward the west, impenetrable fog lay over the glacier and obscured even our immediate surroundings. A measurement by hypsometer gave 8,200 feet for the point lying at the foot of this, the "Devil's Glacier." We had therefore descended 2,600 feet since leaving the "Slaughter House." This was not an agreeable discovery, as we, no doubt, would have to ascend as much again, if not more. We left provisions here for six days and continued our march.

From the camp of that night we had a superb view of the eastern mountain range. Belonging to it we saw a mountain of more wonderful form than I have ever seen before. The altitude of the mountain was 12,300 feet; its peaks roundabout were covered by a glacier. It looked as if Nature, in a fit of anger, had dropped sharp cornered ice blocks on the mountain. This mountain was christened "Helmer-Hansen Mountain," and became our best point of reference. There we saw also the "Oscar Wisting Mountains," the "Olav Bjaaland Mountains," the "Sverre Hassel Mountains," which, dark and red, glittered in the rays of the midnight sun and reflected a white and blue light. In the distance the mountains seen before loomed up romantically; they looked very high when one saw them through the thick clouds and masses of fog which passed over them from time to time and occasionally allowed us to catch glimpses of their mighty peaks and their broken glaciers. For the first time we saw the "Thorvald Nilsen Mountain," which has a height of 16,400 feet.

It took us three days to climb the "Devil's Glacier." On the first of December we had left behind us this glacier with its crevasses and bottomless pits and were now at an elevation of 9,350 feet above sea level. In front of us lay an inclined block-covered ice plateau which, in the fog and snow, had the appearance of a frozen lake. Traveling over this "Devil's Ball Room," as we called the plateau, was not particularly pleasant. Southeasterly storms and snow flurries occurred daily during which we could see absolutely nothing. The floor on which we were walking was hollow beneath us; it sounded as if we were going over empty barrels. We crossed this disagreeable and uncanny region as quickly as was compatible with the great care we had to exercise, for during the whole time we were thinking of the unwelcome possibility of sinking through.

On Dec. 6 we reached our highest point—according to hypsometric measurement 11,024 feet above sea level. From there on the interior plateau remained entirely level and of the same elevation. In 88°23′ S. we had reached the place which corresponded to Shackleton's southernmost advance. We camped in 88°25′ S. and established there our last—the tenth—depot, in which we left 220 pounds of provisions. Our way now gradually led downward. The surface was in excellent condition, entirely level, without a single hill or undulation or other obstacle. Our sleds forged ahead to perfection; the weather was beautiful; we daily covered seventeen miles. Nothing prevented us from increasing our daily distance. But we had time enough and ample provisions; we thought it wiser, also, to spare

our dogs and not to work them harder than necessary. Without a mishap we reached the eighty-ninth parallel on Dec. 11. It seemed as if we had come into a region where good weather constantly prevails. The surest sign of continued calm weather was the absolutely level surface. We could push a tent pole seven feet deep into the snow without meeting with any resistance. This proved clearly enough that the snow had fallen in equable weather; calm must have prevailed or a slight breeze may have blown at the most. Had the weather been variable—calms alternating with storms—snow strata of different density would have formed, a condition which we would immediately have noticed when driving in our tent poles.

Our dead reckoning had heretofore always given the same results as our astronomical observations. During the last eight days of our march we had continuous sunshine. Every day we stopped at noon in order to measure the meridian altitude and every evening we made an observation for azimuth. On Dec. 13 the meridian altitude gave 89°37′, dead reckoning, 89°38′. In latitude 88°25′ we had been able to make our last good observation of azimuth. Subsequently this method of observation became valueless. As these last observations gave practically the same result and the difference was almost a constant one we used the observation made in 88°25′ as a basis. We calculated that we should reach our goal on Dec. 14.

Dec. 14 dawned. It seemed to me as if we slept a shorter time, as if we ate breakfast in greater haste and as if we started earlier on this morning than on the preceding days. As heretofore, we had clear weather, beautiful sunshine and only a very light breeze. We advanced well. Not much was said. I think that each one of us was occupied with his own thoughts. Probably only one thought dominated us all, a thought which caused us to look eagerly towards the south and to scan the horizon of this unlimited plateau. Were we the first, or ———?

The distance calculated was covered. Our goal had been reached. Quietly, in absolute silence, the mighty plateau lay streched out before us. No man had ever yet seen it, no man had ever yet stood on it. In no direction was a sign to be seen. It was indeed a solemn moment when, each of us grasping the flagpole with one hand, we all hoisted the flag of our country on the geographical South Pole, on "King Haakon VII Plateau."

During the night, as our watches showed it to be, three of our men went around the camp in a circle ten geographical miles (11.6 statute miles) in diameter and erected cairns, while the other two

men remained in the tent and made hourly astronomical observations of the sun. These gave 89°55′ S. We might well have been satisfied with this result, but we had time to spare and the weather was fine. Why should we not try to make our observations at the Pole itself? On Dec. 16, therefore, we transported our tent the remaining 5¾ miles to the south and camped there. We arranged everything as comfortably as possible in order to make a round of observations during the twenty-four hours. The altitude was measured every hour by four men with the sextant and artificial horizon. These observations will be worked out at the University of Christiania. This tent camp served as the center of a circle which we drew with a radius of 5 1/6 miles [on the circumference of which] cairns were erected. A small tent which we had brought with us in order to designate the South Pole was put up here and the Norwegian flag with the pennant of the *Fram* was hoisted above it. This Norwegian home received the name of "Polheim." According to the observed weather conditions, this tent may remain there for a long time. In it we left a letter addressed to His Majesty, King Haakon VII, in which we reported what we had done. The next person to come there will take the letter with him and see to its delivery. In addition, we left there several pieces of clothing, a sextant, an artificial horizon, and a hypsometer.

On Dec. 17 we were ready to return. On our journey to the Pole we had covered 863 miles, according to the measurements of the odometer; our mean daily marches were therefore 15 miles. When we left the Pole we had three sleds and seventeen dogs. We now experienced the great satisfaction of being able to increase our daily rations, a measure which previous expeditions had not been able to carry out, as they were all forced to reduce their rations, and that at an early date. For the dogs, too, the rations were increased, and from time to time they received one of their comrades as additional food. The fresh meat revived the dogs and undoubtedly contributed to the good results of the expedition.

One last glance, one last adieu, we sent back to "Polheim." Then we resumed our journey. We still see the flag; it still waves to us. Gradually it diminishes in size and finally entirely disappears from our sight. A last greeting to the Little Norway lying at the South Pole!

We left King Haakon VII Plateau, which lay there bathed in sunshine, as we had found it on our outward journey. The mean temperature during our sojourn there was —13° Centigrade. It seemed, however, as though the weather was much milder.

I shall not tire my esteemed auditors by a detailed description of our return, but shall limit myself to some of the interesting episodes.

The splendid weather with which we were favored on our return displayed to us the panorama of the mighty mountain range which is the continuation of the two ranges which unite in 86° S. The newly discovered range runs in a southeasterly direction and culminates in domes of an elevation of 10,000 to over 16,000 feet. In 88° S. this range disappears in the distance below the horizon. The whole complex of newly discovered mountain ranges, which may extend a distance of over 500 miles, has been named the Queen Maud Ranges.

We found all of our ten provision depots again. The provisions, of which we finally had a superabundance, were taken with us to the eightieth parallel and cached there. From the eighty-sixth parallel on we did not need to apportion our rations; everyone could eat as much as he desired.

After an absence of ninety-nine days we reached our winter quarters, "Framheim," on Jan. 25. We had, therefore, covered the journey of 864 miles in thirty-nine days, during which we did not allow ourselves any days of rest. Our mean daily march, therefore, amounted to 22.1 miles. At the end of our journey two of our sleds were in good condition and eleven dogs healthy and happy. Not once had we needed to help our dogs and to push the sleds ourselves.

Our provisions consisted of pemmican, biscuits, desiccated milk, and chocolate. We therefore did not have very much variety, but it was healthful and robust nourishment which built up the body, and it was of course just this that we needed. The best proof of this was that we felt well during the whole time and never had reason to complain of our food, a condition which has occurred so often on long sledge journeys and must be considered a sure indication of improper nourishment.

During our absence, Lieut. Prestrud with his two companions had done excellent work towards the east and in the vicinity of the Bay of Whales. They succeeded in reaching King Edward VII Land, which Scott had discovered, and in confirming what we had seen. It was found that the Alexandra Mountains are a range entirely snow covered and with an elevation of 1,230 feet. They run in a southeasterly direction as far as the eye can reach and are bounded on the north by mountains 2,000 feet high, which were named "Nutakar" by Scott.

The observations made on this expedition in the neighborhood of

"Framheim" are of great interest. They resulted in determining that the Bay of Whales has a snow-covered bottom.

Simultaneously with our work on land, scientific observations were made on board the *Fram* by Captain Nilsen and his companions which probably stamp this expedition as the most valuable of all. The *Fram* made a voyage from Buenos Aires to the coast of Africa and back, covering a distance of 8,000 nautical miles, during which a series of oceanographical observations was made at no less than sixty stations. The total length of the *Fram's* journey equaled twice the circumnavigation of the globe. The *Fram* has successfully braved dangerous voyages which made high demands upon her crew. The trip out of the ice region in the fall of 1911 was of an especially serious character. Her whole complement then comprised only ten men. Through night and fog, through storm and hurricane, through pack ice and between icebergs the *Fram* had to find her way. One may well say that this was an achievement that can be realized only by experienced and courageous sailors, a deed that honors the whole nation.

In conclusion, you will allow me to say that it was these same ten men, who on Feb. 15, 1911, hoisted the flag of their country, the Norwegian flag, on a more southerly point of the earth than the crew of any other ship whose keel ever cleft the waves.* This is a worthy record in our record century. Farthest north, farthest south did our dear old *Fram* penetrate.

DEVELOPMENT AND STATE OF PROGRESS OF THE UNITED STATES PORTION OF THE INTERNATIONAL MAP OF THE WORLD

BY

W. L. G. JOERG

(Map facing p. 842.)

During the visit of the Transcontinental Excursion of this Society to the United States Geological Survey in Washington on October 14, 1912, the members were given every opportunity to

* The *Fram* penetrated to the head of the Bay of Whales, 78°41′ S. (*New York Times*, March 9, 1912.)